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Degradation in Water Quality Due To Natural and Anthropogenic Contaminant

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ABSTRACT
Water is vital to the existence of all living organism, but this valued resource is increasingly being threatened as human population grow and demand more water of high quality for domestic purpose and economic activities. Water abstraction for domestic use, agricultural production, mining, industrial production, power generation, and forestry practices can lead to deterioration in water quality and quantity that impact not only the aquatic ecosystem but also the availability of safe water for human consumption. Providing safe and secure water to people around the world and promoting sustainable use of water resources are fundamental objectives of the Millennium Development Goals. The ability to properly track progress toward minimizing impacts on natural environments and improving access of humans to safe water depends on the availability of analytical data. As such monitoring water quality in surface and groundwater resources, is a necessary activity at all governing levels. Water quality and quantity are intimately linked although not often measured simultaneously. Monitoring of water quantity can be undertaken, to a certain degree, with a minimal amount of human intervention, once a monitoring station has been set up. In contrast, water quality is usually determined by analyzing samples of water collected at different sites.

Keyword: Anthropogenic, Economic Activities, Water Abstraction, Ecosystem, Contaminant.

1. Introduction :

The present investigation is intended to provide an overview of the major components of ground water quality. Assessment of water quality monitoring data are used to illustrate key features of aquatic environments, and to demonstrate how human activities on the landscape can influence water quality in both positive and negative ways. Clean and concise background knowledge on water quality can serve to support other water assessments.

The quality of surface of ground water is a function of either or both natural influences and human activities. Without human influences, water quality would be determined by the weathering of bedrock minerals, by the atmospheric processes of evapotranspiration and the deposition of dust and salt by wind, by the natural leaching of organic matter and nutrients from soil. Water in the natural environment contains many dissolved substances and non-dissolved particulate matter. Dissolved salts and minerals are necessary components of good quality water as they help maintain the health and vitality of the organisms.

An abundant supply of clean, usable water is a basic requirement for many of the fundamental uses of water on which human depend. Typically water quality is determined by physical, chemical characteristics of a water sample with water quality guidelines or standards. These are designed to enable the provision of clean and safe water for human consumption. Thereby protecting human health. These are usually based on scientifically assessed acceptable level of toxicity to human being.

2. Study Area :

The study area comprises villages in Raisen District of 80 to 150 Km from the city Bhopal. The geological formation of the land is mainly basalt rock. The locality is selected from Gairatganj, Begumganj & Silwani Block of Raisen District which is situated in North East Direction of Bhopal.

3. Material and Method :

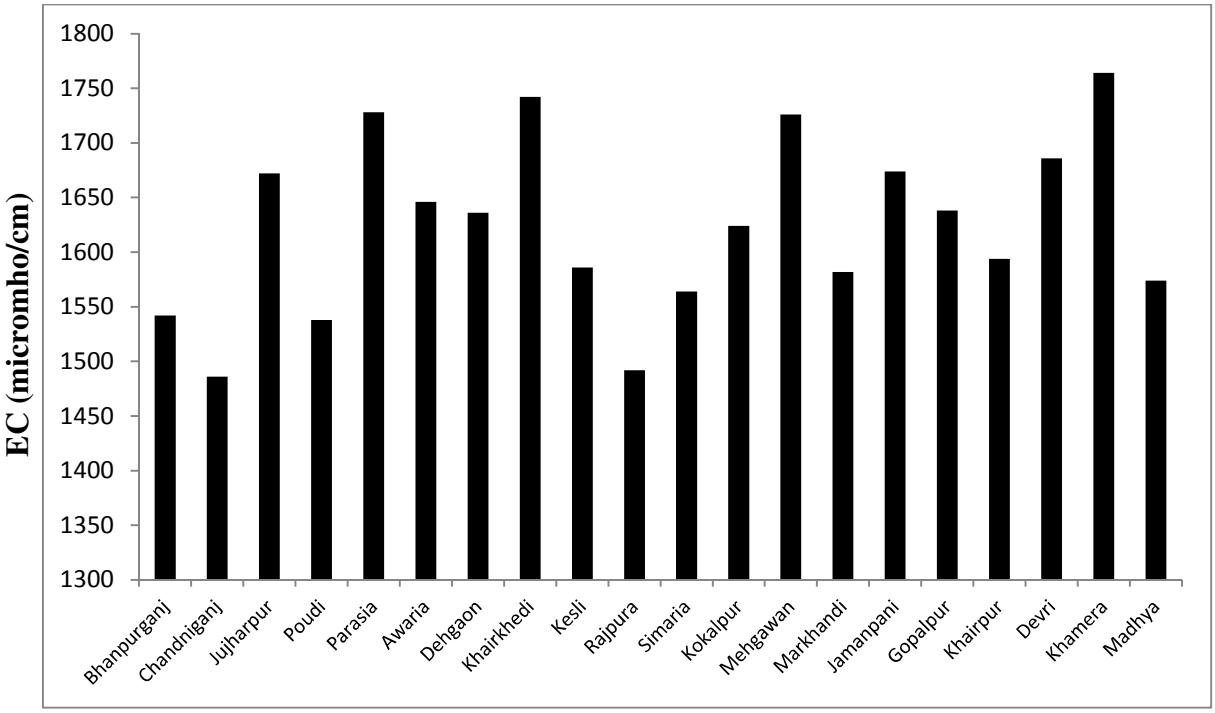
Ground water samples are collected from the above said region. The collected samples were transferred into plastic container for analysis. These water samples were analysed for pH, electrical conductivity using pH and EC meter. Total dissolved solid (TDS) determine by computation depending on the relative concentration of ions; Total alkalinity was estimated by titrating with hydrochloric acid. Total hardness (TH) were analyzed volumetrically, using standard EDTA. Chloride is estimated by standard $AgNO_3$ titration. Other ions were analysed by spectrophotometer as given by APHA[2] 1992.

Table No. I A
Analytical data for Physicochemical parameter for some villages in Raisen District

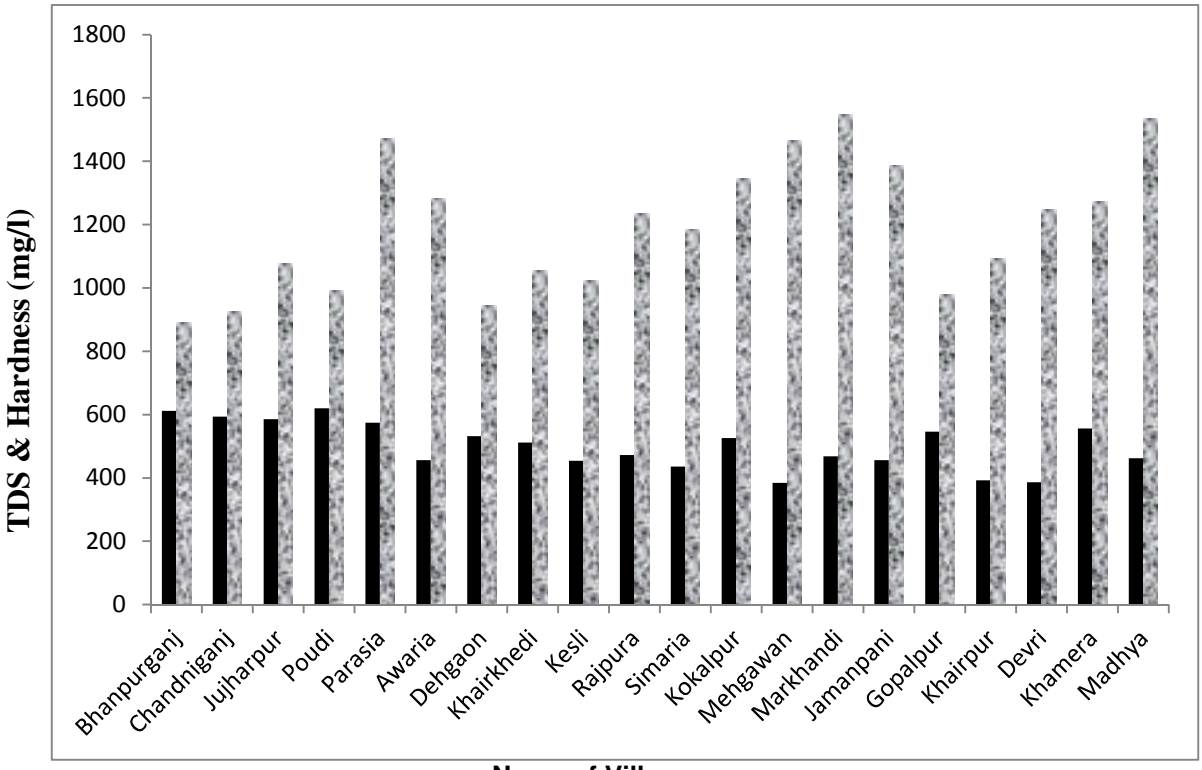
S.No.	Name of Villages	pH	E.C. micro mho/cm	Alkalinity mg/l	Hardness mg/l	TDS mg/l	NO_3^- mg/l	SO_4^{-2} mg/l	Cl^- mg/l	F^- mg/l
1.	Bhanpurganj	7.4	1542	222	612	892	32	240	426	2.84
2.	Chandniganj	7.6	1486	324	594	924	46	232	298	2.28
3.	Jujharpur	8.2	1672	316	586	1076	55	188	348	2.56
4.	Poudi	6.6	1538	218	620	992	42	176	274	7.76
5.	Parasia	7.8	1728	296	574	1472	48	196	296	2.68
6.	Awaria	7.1	1646	246	456	1284	52	262	326	3.10
7.	Dehgaon	6.8	1636	216	532	946	38	252	238	5.12
8.	Khairkhedi	6.7	1742	202	512	1056	44	224	244	7.22
9.	Kesli	7.9	1586	452	454	1024	58	276	228	1.84
10.	Rajpura	7.6	1492	386	472	1236	62	278	216	2.20
11.	Simaria	8.3	1564	476	436	1186	50	192	314	6.32
12.	Kokalpur	7.5	1624	374	526	1346	46	234	276	5.25
13.	Mehgawan	6.4	1726	426	384	1466	57	168	242	7.45
14.	Markhandi	7.6	1582	434	468	1548	62	204	312	2.72
15.	Jamanpani	6.5	1674	316	456	1388	46	302	402	5.34
16.	Gopalpur	7.2	1638	354	546	978	55	198	378	1.76
17.	Khairpur	7.8	1594	284	392	1092	35	212	268	2.45
18.	Devri	8.2	1686	486	386	1248	47	326	226	3.56
19.	Khamera	6.9	1764	516	556	1274	36	244	332	5.92
20.	Madhiya	8.4	1574	484	462	1536	59	216	216	2.06

Table No. I B
Permissible Value of Constituent and its ranges in Ground Water Samples

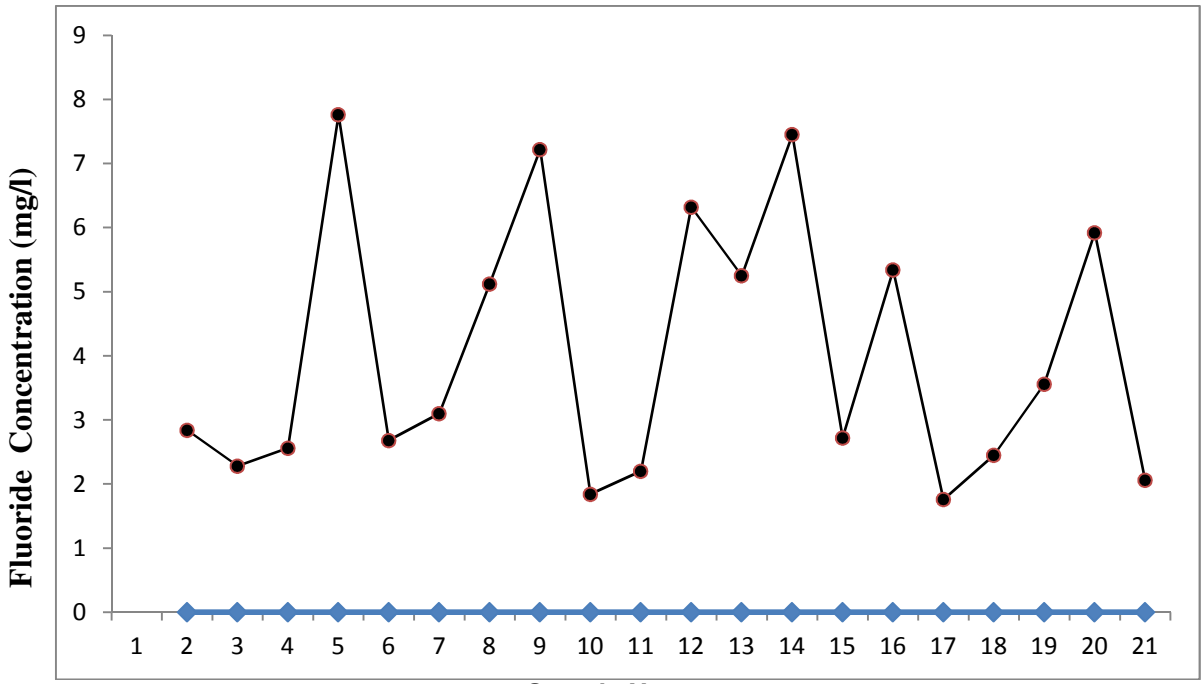
Sl. No.	Constituents	Bureau of Indian Standard (IS-10500:1991)	Range
1.	pH	6.5-8.8	6.4 – 8.4
2.	EC (µmhos/cm)	700-3000	1426 – 1764
3.	TDS (mg/l)	500-2000	892 – 1548
4.	Alkalinity	200-600	202 – 516
5.	Hardness	200-600	384 – 594
6.	Cl^- (mg/l)	250-1000	216 – 426
7.	SO_4^{-2} (mg/l)	150-400	168 – 326
8.	NO_3^- (mg/l)	< 45	32 – 62
9.	F^- (mg/l)	1.0-1.5	1.76 – 7.76



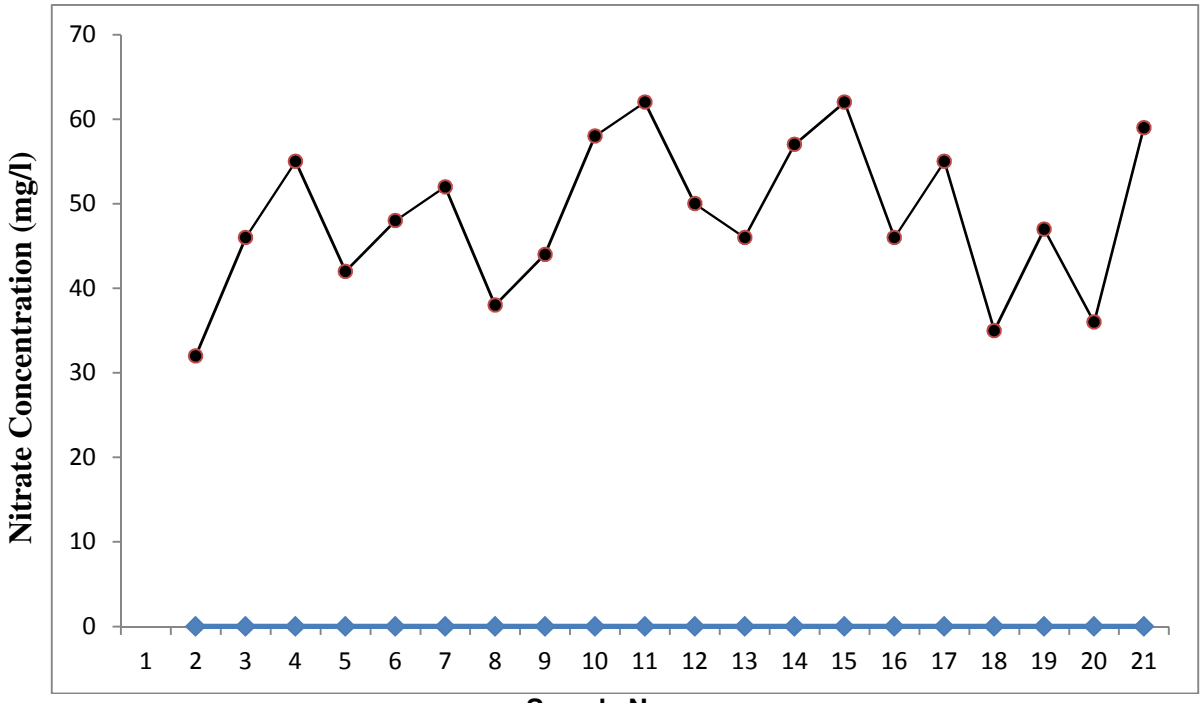
Graph No. 1
Showing the variation of EC Value in different villages of Raisen District



Graph No. 2
Showing the variation of Hardness & TDS Value in different villages of Raisen District



Graph No. 3
Showing the variation of Fluoride in different villages of Raisen District



Graph No. 4
Showing the variation of Nitrate in different villages of Raisen District

4. Result & Discussion :

The quality of groundwater in villages of Raisen district was studied to evaluate the suitability of groundwater for domestic and agricultural purposes. In villages the government supply of water is still not prevailing. Village people have to depend solely on groundwater. As the table reveals the pH value is in acceptable range from 6.4 to 8.4 ie neither too acidic nor too basic taste is neither sour not bitter. Increased value of pH more than 7.5 shows the increased alkalinity. Electrical conductivity varies from 1426 to 1764 micro mho/cm showing high concentration of ions present in ground water. Total dissolved solids value is highly varied ranging from 892 to 1556 mg/l. showing the presence of dissolved solids. Hardness of water is also high indicating towards geologic formation of the area.

The permissible limit of fluoride is 1.5 mg/L It is observed that most of the places exceeds the limiting value and some locality showing very high value. Although fluoride values within the limit is beneficial for hardening the enamel and reducing the increase of carries[3] but if the value exceeds it cause dental and skeletal fluorosis[12]. Besides long term of high level of fluoride intake is associated with adverse effect[5,9] on fertility, thyroid changes, urolithiasis etc. Increase in fluoride is entirely due to basalt rocks which is the geologic formation of these areas. Nowadays due to over exploitation of groundwater and increase in drilling depth, the concentration of fluoride increases day by day. As it is a natural phenomenon of dissolution of fluoride from fluoride bearing rocks under normal pressure and temperature condition from which it get weathered. Hence the water should be treated[4] properly before consuming it.

Gradual increase in nitrate level in groundwater poses a serious threat to human health[6-8]. For infants it is very dangerous as it may cause methaemoglobinaemia. Probably excess of fertilizer and manure is the cause of non- point source of nitrate pollution in water. Without careful and precise application and timing of nitrogen fertilizer, nitrate can leach through the soil into the groundwater.

5. Conclusion :

Hydrogeochemical studies of some villages in Raisen district reveal that ground water quality is strongly influenced by geologic formation of that area and to some extent impact of agricultural pollution. The high fluoride content is attributed to fluoride bearing rock. Once a person is affected by the toxicity of high fluoride intake there is no remedy. Hence preventionary steps[11,13] should be taken to provide people safe potable water ie below the limiting value of fluoride in drinking water to overcome the problem of fluoride contamination, various methods and techniques are developed and developing as well. But all the methods can

be categorized broadly into three techniques. (1) By Activated Alumina (2) By Reverse osmosis (3) By Electrodialysis reversal process.

NItrate contamination is due to indiscriminate use of nitrogen fertilizer and leakage from sewage system. Though nitrate is considered relatively nontoxic. Exposure of high level of nitrate in drinking water linked to various adverse effect ranging from enlargement of thyroid to fifteen types of cancer and even hypertension.

We should be very much attentive and careful about preventionary steps to check and control further degradation of water quality and minimize the contamination in water.

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